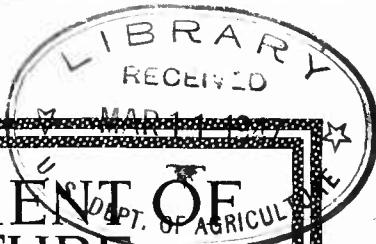


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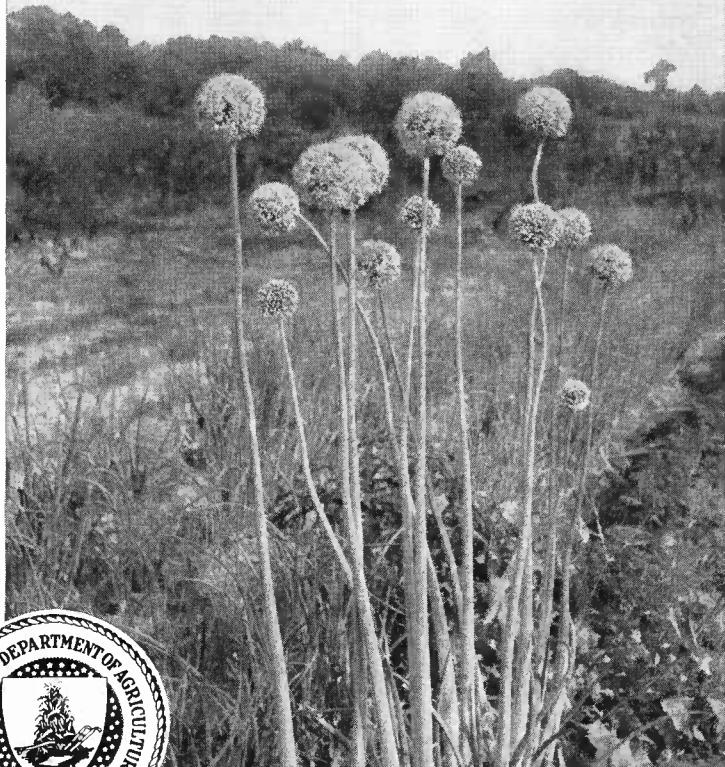
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# U. S. DEPARTMENT OF AGRICULTURE

FARMERS' BULLETIN No. 1390

## VEGETABLE SEEDS FOR THE HOME AND MARKET GARDEN



**T**HE HOME GARDEN and the market garden have originated many of our present American vegetable varieties.

The tendency of our horticulture at present is toward the large-scale production of vegetables, often for shipping long distances, and this has caused a decided lessening of the number of varieties handled. The characters necessarily chosen for those retained are determined by shipping and marketing requirements, and high culinary quality too often has been neglected.

Both the home and market gardener are in a position to profit by growing vegetables of high culinary quality.

It is important that the production of improved strains by gardeners should be encouraged, and with that purpose in view this bulletin aims to give plain and explicit directions for saving the seed of garden vegetables on a small scale.

**Washington, D. C.**

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Revised October 1936  
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# VEGETABLE SEEDS FOR THE HOME AND MARKET GARDEN<sup>1</sup>

By W. W. TRACY, Sr., formerly *superintendent of testing gardens*, and D. N. SHOEMAKER, formerly *horticulturist, Division of Fruit and Vegetable Crops and Diseases, Bureau of Plant Industry*

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## SHOULD GARDENERS GROW THEIR SEED?

**I**N MANY CASES it will not pay gardeners to grow their seed. The trucker who produces a few things in large quantity for shipment can rarely produce his seed economically. His methods are not intensive and his seed requirements are large.

The home or local market gardener can often meet his own seed requirements, at least for some of his vegetables. He can get full value for vegetables of higher quality, as he is in direct connection with the consumer. The more intensively he works his soil the more important the quality and uniformity of his seed will be to him. The most intensive cultivation is given to greenhouse crops, and the greenhouse gardener therefore can often save his own seed to very great advantage.

Many diseases of vegetable crops are seed-borne. Seeds saved from plants affected by these diseases will infect the new crops and may cause serious loss or failure. Special precautions should therefore be taken to save seeds only from crops that are free from certain diseases. Some of the more important crops and seed-borne diseases that affect them are listed below:

## IMPORTANT VEGETABLE CROPS AND THE SEED-BORNE DISEASES THAT AFFECT THEM

Crop :	Disease
Cabbage-----	Black rot.
Cauliflower-----	Blackleg.
Turnip-----	
Radish-----	Bacterial blight. Halo blight. Anthracnose. Mosaic (virus).
Bean-----	Bacterial blight. Ascochyta leaf blight.
Pea-----	

<sup>1</sup> This bulletin supersedes Farmers' Bulletin 884, which was prepared by the late W. W. Tracy, Sr., as a war-emergency publication. It has been somewhat revised and extended to meet present conditions by V. R. Boswell, principal horticulturist, and B. L. Wade, senior geneticist, of the Division of Fruit and Vegetable Crops and Diseases, Bureau of Plant Industry.

## Crop—Continued.

	<i>Disease</i>
Cucumber-----	Angular leaf spot. Anthracnose:
Muskmelon-----	}
Watermelon-----	} Anthracnose.
Tomato-----	Bacterial canker. Bacterial spot. Early blight (collar rot). Nailhead. Fusarium wilt.
Pepper-----	Bacterial spot.
Eggplant-----	Phomopsis blight.
Celery-----	Late blight.

In general, rainy weather at or soon before harvesttime causes serious trouble from disease or by interfering with the proper ripening and drying of seeds. Semiarid or arid regions of the West have distinct advantages over the East in the production of most vegetable seeds.

## ADVANTAGES OF HOME SEED GROWING

In earlier times the home saving of seeds was the rule. Many garden varieties carry place names, which usually indicate that they have been developed by community selection in the localities shown. As late as the middle of the last century many individual market gardeners in this country jealously guarded the seed of certain varieties and strains which represented years of intelligent selection in their hands. A few such superlative varieties are yet to be found in the possession of gardeners near the old market-gardening centers. In the past, also, the village and farm gardener saved his own seed of the few varieties of vegetables he grew. This custom has practically ceased, but here and there are farmers and villagers who cling to "family" varieties of certain vegetables. Local types of long standing are probably most common in the Appalachian Mountain region. European gardeners have retained local or family varieties much more tenaciously than Americans.

That there are advantages in thus saving seed where it is grown is generally recognized. This widespread opinion is also held by seeds-men, since the enthusiastic description of a novelty frequently includes a history of its having been obtained with great difficulty from skillful growers in whose possession it had remained for many years or even for generations. These advantages are twofold: (1) The selection which the gardener gives to his seed plants, while not greater than that which the seed grower gives to his seed stock, is often better than can be given to the seed that is placed on the market; and (2) the plants selected will be the ones which succeed best under the local environment.

Certain vegetables that normally are cross-pollinated will mix badly if two varieties or two kinds of the same species are allowed to flower in the same garden or in places near each other. It is believed inadvisable for the small grower to attempt seed saving of more than one variety of such crops unless they can be grown some hundreds of yards apart. Even when separated such a distance, wind, birds, or bees and other insects may cause bad mixing by cross-pollination. The danger of cross-pollination from a neighbor's garden may make questionable the growing of cross-fertilized species.

Some vegetables that are entirely or quite readily cross-pollinated among plants of their kind are: Corn, cucumbers, melons, squash, pumpkins, cress, mustard, brussels sprouts, cabbage, cauliflower, collards, kale, kohlrabi, spinach, onion, radish, beet, turnip. Those less readily cross-pollinated are eggplant, pepper, tomato, carrot, and celery. Beans, peas, okra, and lettuce are generally self-pollinated.

A few of our common vegetables are so closely related to others that they will cross-pollinate or mix between kinds as well as between varieties. Sweet corn will of course cross with field corn.

The so-called summer squashes such as White Bush Scallop, Zucchini, and Golden Summer Crookneck belong to the same species as, and will readily cross with, certain of the pumpkins such as Connecticut Field. Winter squashes do not cross naturally with the summer varieties of squash.

Watermelons and citrons will cross, but watermelons will not cross with cucumbers, squash, or pumpkins. Neither cucumbers nor muskmelons will cross with any of the other vine crops.

Cabbage, kale, cauliflower, broccoli, brussels sprouts, and kohlrabi are all members of the same species and will intercross and mix freely among themselves in any combination.

Beets and Swiss chard will cross readily with each other or with sugar beets.

Varieties of turnip grown for the roots will cross with Seven Top turnip, but not with rutabagas.

Weather or other conditions sometimes cause a short crop of seed or a failure. Fortunately, well-matured seeds, if properly stored, with the possible exception of those of the parsnip and onion, will retain their viability for 3 to 5 years. It is thus possible to tide over poor years and grow all the seed needed for a smaller garden, even to the extent of handling two or more varieties of one vegetable.

#### A METHOD OF SELECTION

Some knowledge of the process of selection is necessary to good saving of seed. There is also much current misconception on the subject.

The opinion is widely held that the individual fruit is the unit in practical selection rather than the plant. To illustrate, it is believed that progress may be made in procuring an early variety of tomato by sowing seed of the first fruits to ripen. On any one plant all fruits are equally able to carry the tendency to earliness, and the way to get earliness is to search for the plant which produces ripe fruit before its fellows. When this plant is found its late crop is just as valuable for the purpose in hand as its early crop. Likewise in selecting smooth-fruited strains of tomato, it is important to select plants bearing a uniform crop of smooth fruit rather than to select smooth fruits at random after picking from the vines.

Many of the better stocks and varieties of vegetables that are almost entirely self-fertilized (self-pollinated) are practically pure lines. This means that their hereditary make-up is pure, unmixed with other sorts. Except where accidental mechanical mixing of seed has occurred to give a mixture of types, or where seeds from

a rare and accidental cross have been planted, there is little chance of being able to make any improvement by selection.

Planting stocks of potatoes and sweetpotatoes often become mixed with different varieties, or infected with disease, so that marked differences appear among the plants with reference to appearance or yield. The selection of high-yielding disease-free hills of uniform material from a mixed and partly diseased stock should eliminate the variable off type sorts and result in improving the stock developed from the selected hills. If, however, the original stock is neither mixed nor diseased, no improvement can be accomplished by selection.

In making selections of any vegetables such as beans, tomatoes, corn, etc., if several plants are selected for trial it is best that the seed of each plant be kept separate and so planted the second year. If the first year of such an enterprise is called the selecting year, the second might well be called the discarding year. This is because the good and bad points will show more plainly in the progeny of the selected plants than in the plant itself, and the grower will usually be surprised at the number of bad points. The care and work involved in keeping the individual parcels of seed separate will be well repaid by the opportunity to discard the poor progenies, which could not have been done if all the seed selected the first year had been bulked. This method of growing selections is called the "progeny row" method, as rows of equal length are usually devoted to each progeny of the first year's selection. The same process may be continued with each of the lines chosen in the first progeny-row selections, but the gain in succeeding years is rarely as striking as that made the first year. If the first year's progeny-row trial shows several excellent progenies, these, if sufficiently similar, may then be bulked, though it is safer to grow them as distinct stocks for 1 or 2 years before combining them.

#### MARKETING HOME-SAVED SEED

A grower may wish to sell some of his surplus seed. His best opportunity to do this will be among his neighbors, who are acquainted with him and his variety or strain. It is difficult to dispose of small lots to seedsmen, who must become acquainted with these varieties before risking a purchase. It will sometimes be possible to make a deal with a seedsman after the selection or strain has proved itself of value and so has established a reputation.

Since in the vegetable-seed trade seeds are usually grown under legal, written contract, a gardener wishing to try commercial seed growing will find it best to apply to wholesale seed-growing firms, giving an account of his experience and his facilities for seed growing. Seedsmen rarely make a contract until they have had a representative examine the project. They have found that a contract protects both parties as well as the seed stocks; a contract is therefore nearly always required.

#### VEGETABLES CLASSIFIED FOR SEED-GROWING PURPOSES

Vegetables may be grouped in many different ways, but probably the most useful classification for the purposes of this bulletin is that based on seeding habit, whether annual, biennial, or perennial.

(table 1). A secondary basis is found in the part of the plant which is used for food, whether seed, fruit, leaf and stem, or root. The use of these bases makes possible 12 classifications, 7 of which are represented among the more commonly grown vegetables. It is interesting to note that all seed and fruit vegetables are annuals and that most leaf, stem, and root vegetables are biennials.

#### PLANTS THAT BEAR SEED THE YEAR THEY ARE PLANTED (ANNUALS)

Many garden plants are annuals, including all those of which the seed or the fruit is the part eaten.

#### VEGETABLES THE SEEDS OF WHICH ARE EATEN

Very little care is required to save seed for a home supply of the crops the seeds of which are eaten, since the seed is well advanced toward maturity when usable. Selection is important in this group, however, especially to insure healthy seed. Any surplus dried seed of these plants may be used for food.

#### BEANS AND PEAS

The best seed of beans and peas can be obtained by marking a few of the finest plants with a bit of cloth at the beginning of the harvesting season and allowing the entire crop of these plants to ripen for seed. In making such selections it is best to choose plants most alike in varietal character and earliness. When ripened until the pods are dry, these plants should be pulled in the early morning, in order to avoid shattering, and hung or spread in any airy dry place until the seed is quite hard. Then the seed should be shelled and spread out not more than two or three grains deep and, when dry, stored for the winter in a cool, dry place.

TABLE 1.—*Vegetables grouped according to seeding habit and the part used for food*

Seeding habit	Vegetables, the parts of which are used for food			
	Seed	Fruit	Stem and (or) leaf	Root
Annuals, producing seed the year they are sown.	Beans. Corn. Peas.	Beans (snap). Cucumber. Eggplant. Muskmelon. Okra. Peas (sugar). Pepper. Squash. Tomato. Watermelon.	Cress. Endive. Lettuce. Mustard.	Radish (early).
Biennials, producing seed after a winter rest.			Brussels sprouts. Cabbage. Cauliflower. Celery. Collards. Endive. Kale. Kohlrabi. Leek. Onion. Parsley. Potato. Spinach.	Beet. Carrot. Celeriac. Parsley. Parsnip. Radish (late). Salsify. Turnip.
Perennials.....			Asparagus. Rhubarb.	

Both peas and beans may hybridize to some extent in open-ground culture; so seeds of more than one variety should be saved only when the varieties are separated by space of a few rods.

Some very destructive bean diseases, including pod spot, are carried in the seed; so it is extremely important to observe the general rule that no seed from diseased plants should be saved. Never save seed from pods which are not bright and clean.

#### SWEET CORN

The best seed corn can be obtained by allowing it to ripen on the plant, and since a single ear will plant a small garden, it is quite practicable to do this. Select the best and earliest ears by stripping down the husks to examine the grain and to remove any worms that may be found, and then carefully fold the husks back and hold them in place by an elastic band or a string. Allow these ears to ripen thoroughly on the stalk. In the North it is often better to pull and hang the plant where there will be no danger from moisture, frost, or even chilling until the seed is thoroughly dry.

Sweet corn spoils much more quickly than field corn and cannot readily be cured in large shocks, but should be husked from the stalk and spread thinly on staging to cure. A convenient way of storing sweet corn is on the ear.

Since corn is pollinated by the wind, varieties will cross extensively; it is therefore necessary to isolate from all other corn a plot from which seed is to be saved.

#### VEGETABLES THE FRUITS OF WHICH ARE EATEN

A fruit which is developed from a blossom consists of the seed and its enclosing parts. It is not necessarily fleshy, though that is the popular conception of the term. It is a simple matter to save seeds of these vegetable fruits. They are in large part allowed to ripen before being brought to the table, and there is only the additional trouble of cleaning the seeds, which otherwise would be discarded.

#### CUCUMBER AND SUMMER SQUASH

Cucumbers and summer squashes are used commonly long before they are ripe, and even before they have reached their full size, the one for pickles or for salad, the other as a vegetable. In saving seeds, select and mark fruits of desirable character while in the usable stage and allow them to remain on the vines until fully ripe. Such a condition will be indicated by a change of color, or by this change and a hardening of the surface. Split the ripe fruits, scrape out the seed and pulp, and wash them until clean, pouring off the refuse and the light, floating seeds. Seedsmen, when handling large quantities, ferment the mass of seed and pulp from these and other fleshy fruits, but most home gardeners will find it simpler to clean the seed immediately in one operation. Then spread the washed seed not over two grains deep and place it in the bright sunshine to dry. Stir the seed frequently while drying, but do not subject it to frost or even a severe chill. Any quantity less than a quart of seed should be ready for storing after 1 day's drying. If a large quan-

tity of seed is being saved, it is important not to bulk it until thoroughly dry, as it heats readily. This drying will take from 2 to 5 days.

Different varieties of cucumber will cross, as well as different varieties of summer squash. Only one kind of each can be grown in any one garden if seed is to be saved. Summer squash will cross with Connecticut Field pumpkins, but can be safely seeded beside Hubbard squash and other varieties of the Hubbard group.

#### WINTER SQUASH, MUSKMELON, AND WATERMELON

The fruits of winter squash, muskmelon, and watermelon are not used until ripe. Seed saving consists in selecting satisfactory fruits of high quality and washing the seed with water until clean; then spreading, stirring occasionally until dry, and storing.

As varieties of these plants will cross extensively, they must be isolated from their own kind. The three will not intercross.

#### TOMATO

The character of tomato plants is of great importance. Select one or more plants which bear a high proportion of good fruits, taking into account size, smoothness, solidity, and freedom from cracking in the fruit, and vigor, productiveness, and freedom from disease in the plant.

The entire seed crop of a plant producing uniformly good fruit will be better than that from a superlative fruit from a plant with uneven and some inferior fruits. Tag the fruits on these selected plants and allow them to ripen on the plant until past their edible condition, but do not permit them to decay. Halve the fruits by cutting across the cells. By gentle pressure it is then possible to squeeze the seeds and seed pulp free from the flesh and skin of the tomato. Fold the seeds with the softer pulp into a square of coarse muslin, and work this energetically with the fingers under water. It is thus possible to clean the seeds very well by forcing the pulp out through the cloth. When the seed is clean, spread it thinly in an airy place until dry and then store it.

In the fermentation method of seed recovery the fruit is crushed and allowed to ferment for 3 or 4 days at temperatures not exceeding 70° F. and with frequent stirring of the mass. The seeds will settle to the bottom and the pulp will rise to the surface and can be poured off. The seed should be washed with pure water until clean, spread out thinly, stirred frequently until dry, and then bagged. If half a pound or more of seed is to be saved it will pay to use this method. It is of particular importance and effectiveness in preventing the seed distribution of the bacterial canker disease.

Tomatoes intercross to a small extent only. Seed of more than one variety may safely be saved from one garden if the plants are a few yards apart.

#### EGGPLANT

For the home garden, seeds of the eggplant in sufficient number can be picked from ripe fruit with a penknife and dried and stored.

To save larger quantities of seed, allow the fruits to become thoroughly ripe. Cut off the stems and reduce the fruits to a pulp by grinding or in a mortar. Wash immediately, using two screens of

different mesh. Spread very thinly and dry quickly. If the seed is not sufficiently dry by night it often sprouts and is lost.

#### PEPPER

Select well-ripened fruits of peppers, spread the seed thinly until very dry, and then store it.

Pepper varieties probably cross more frequently than tomatoes. If pungent and sweet peppers are grown together some disastrous crossing may occur.

#### OKRA

Okra seed for a small garden can best be procured by selecting one or more plants for seed, picking the early pods until the plant is growing vigorously, and then allowing it to set and mature a full crop of pods. The varieties having angular pods will split open, and the seed will be lost unless the ripe pods are harvested immediately. The round or velvet-podded varieties may be left on the plant until all are ripe, since they do not split open. The seeds after removal from the pods are to be dried and stored.

#### ANNUALS THE STEMS OR LEAVES OF WHICH ARE EATEN

Only four stem-and-leaf vegetables yield seed the first year under normal conditions.

#### LETTUCE

Lettuce is an annual crop, and if the seed is planted early enough so that the setting and ripening do not occur during the greatest heat of summer all varieties may be seeded. The safest practice is to start the plants intended for seed in hotbeds or coldframes and then transplant them to the garden. As the plants reach edible maturity select a few of the most satisfactory ones for seed; cut out any crowding plants; give the soil a shallow cultivation; and, if the season is very dry, water the plants. As the seeding plants develop, it may be necessary with some of the harder heading sorts to cut or pull the head leaves carefully apart to allow the seedstalk to push through.

The seed crop matures slowly. When the first seed heads open so that there is danger of serious loss from shattering, pull the plants (fig. 1) and put them, roots up, in a paper bag, hanging in a dry, airy place until the seed is fully ripened. Then thresh it, clean it of stems and dirt by sifting and winnowing, and store in a dry place.

Lettuce varieties can safely be seeded in the same garden, as they cross only to a slight degree. Plants of different varieties saved for seed should be separated by a few feet.

#### MUSTARD

Mustard seed can readily be grown from a crop sown in very early spring. When the pods have turned yellowish, cut the seedstalks in the early morning and spread them on paper or cloth under shelter. When the pods are quite dry, beat out the seed and spread it thinly for a week or 10 days, as it heats readily if in large bulk.

As the varieties cross readily, only one variety should be grown in a garden if seed is to be saved.

#### ENDIVE

If planted very early, endive may be grown as an annual; but it is better treated as a biennial. (See p. 10.)

#### GARDEN CRESS

Garden cress grows very readily and seeds quickly. Plants showing the most desirable leaf should be chosen and allowed to grow to seed. They should be pulled before the seed pods open. After being dried, the seed should be beaten out and stored.

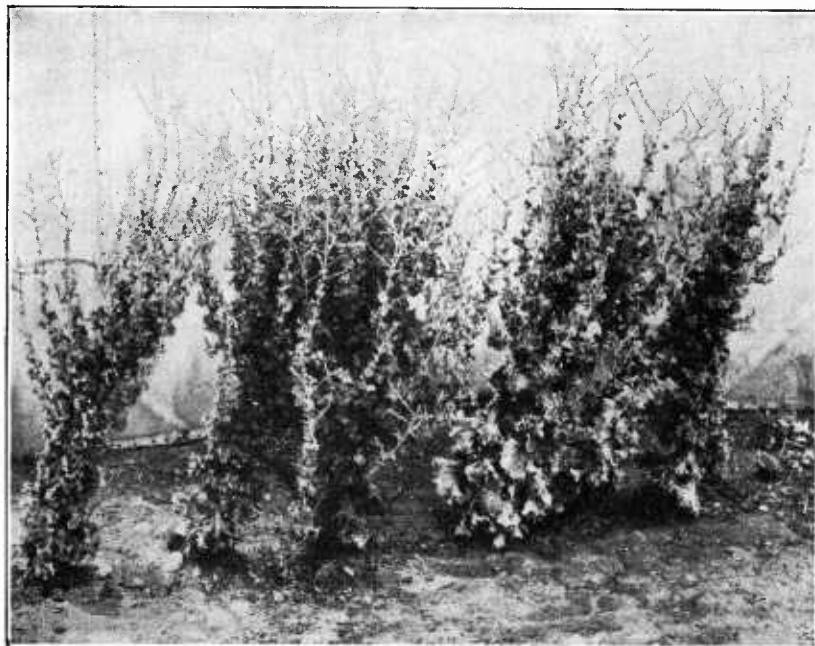


FIGURE 1.—Seeding plants of lettuce. These will soon be ready for harvest.

#### ANNUALS THE ROOTS OF WHICH ARE EATEN

Early radishes are the only annual root vegetable. Most varieties of early radish planted in the spring as soon as the ground can be worked will produce seed. In such crops some plants will shoot to seed quickly, but they are usually the poorest stock, and the seed of these cannot be depended upon to give good roots. It is better, therefore, to pull the plants and to select carefully some of the finest roots for seeding. Cut off most of the tops, leaving a few small central leaves. Lay the plants in a moist, airy place for a few hours, or overnight, to harden; then carefully set them out, with the crown about an inch below the surface. Usually most of them will start into growth and mature a crop of seed. When this ripens, cut the

plants and lay them on a sheet exposed to the sun. The seed will harden quickly and can then be beaten out, thoroughly dried, and stored.

**PLANTS THAT REQUIRE A WINTER REST BEFORE PRODUCING SEED  
(BIENNIALS)**

The biennials include nearly all the vegetables of which the growing parts, such as stems, leaves, or roots, are used as food. One must plan beforehand in growing seed of these, since they must be carried over winter and usually require protection.

**BIENNIALS, THE STEMS OR LEAVES OF WHICH ARE EATEN**

**SPINACH**

Spinach may be grown for seed as an annual; but to be successful it must be planted very early. The crop which has been wintered over is much better for seed growing. With the protection of a light covering of straw it may be planted in the autumn and wintered over in most parts of the United States. This protection is not necessary south of the latitude of Philadelphia.

As spinach plants come into flower they may be seen to differ materially. The males, which are usually the first to bloom, will produce on tall stems an abundance of pollen, which is easily blown about by the wind, but no seed. The females will produce no pollen, but at each leaf on the upper part of the stem will appear round or more or less prickly flowers, which, if the plant stands near one of the kind first described, will develop seed. Both sorts of plants grown near each other are essential to the production of seed. The seed matures slowly and unevenly. Plants should be pulled and put into a paper bag, which should be hung in a protected place until the seed is ripe and dry, when it can be threshed off, winnowed, and stored. Varieties seeded in the same garden will mix extensively.

**ENDIVE**

To grow seed of the endive it is best to plant the crop in the late fall (September in the latitude of Philadelphia), winter-over the plants in coldframes, and grow to seeding in the spring. The plants bloom through a long season and should be pulled and hung up to dry when most of the heads are ripe. They are difficult to thresh, but, after drying, can be placed in a stout bag and beaten until the seeds are released. These must then be sifted, winnowed, and stored.

Seed-eating birds, especially goldfinches, are very fond of endive seed. Where only a few plants are being grown for seed, it is often necessary to cover them with netting to prevent the birds from eating the seed as rapidly as it ripens. This crop hybridizes scarcely at all.

**KALE, COLLARDS, CABBAGE, CAULIFLOWER, AND KOHLRABI**

All the plants in the cabbage group require the same care in isolating varieties and kinds and in harvesting and curing the seeds. As they shatter from the seed pods very readily, it is best to cut the

seedstalks when the pods have turned yellow. Early morning, when the plants are moist with dew, is the best time to harvest them. Spread the plants in a dry, airy place on sheets of paper or cloth to ripen and cure. When the seed is quite hard, beat it out, and spread it in a thin layer for further curing. All these precautions are necessary, because these seeds heat very quickly if not entirely ripe and dry. As they hybridize freely among themselves, one should not attempt to grow more than one crop of this group in the same garden at the same time.

Kale and collards are very hardy and may be left out all winter, with slight protection in the North. They will send up blossom stems early in the spring and mature a crop of seed.

Kohlrabi should be planted in midsummer, so as to make good-sized "bulbs" for storing in trenches or coldframes. They are set for seed early in the spring.

Seed of cabbage in large quantities is grown in many different ways. In some places the stumps from which matured heads have been cut are successfully set for seeding.



In Denmark the head and a bit of the stem are cut off and wintered in shallow trenches. Early in the spring they throw out roots like a giant cutting, start into growth, and produce a good crop of seed. On Long Island plants are set so late in the season that they do not develop marketable heads before fall, but the plants are stored in trenches and given a little protection.

When they are set in the spring they produce a crop of seed. It is possible to grow seed from any part of the cabbage plant that includes a bit of the stem that has wintered so as to be in green and healthy condition. It is generally necessary, however, in order to obtain a good yield from plants of most commercial strains, to set out two or more plants (fig. 2), as most plants are self-sterile. Plants for seeding should be set as early in the spring as practicable and protected from frost, especially if they have been blanched in storing.

Growing cauliflower seed is such an uncertain venture for out of doors that it is not worth while for the gardener without a greenhouse to undertake it. The plants must be stored in trenches or cold cellars over winter and planted outside as soon in the spring as weather will permit. The difficulty in storing is great, and skill is needed to make a successful business of growing cauliflower seed. It is easy to grow a home supply of seed if one has a greenhouse.

The plants for the seed crop should be started from October 1 to 15 and given abundant space in the greenhouse. It is important that none of the outer leaves be allowed to decay, or the whole plant may be lost.

#### PARSLEY

Parsley is hardy and south of Philadelphia may safely be left in place in the garden for seeding in the spring. In the North it will require only a slight earth covering to withstand the winter. The seed is produced in flat-topped clusters. When there is danger of loss of the seed, cut the plants, dry them on a sheet, thresh, and store.

#### CELERY

Celery is not grown extensively enough in home gardens to make home seed saving an important consideration. Plants which have been stored for winter, if carried over and planted early in the spring, will flower and ripen seed in early summer. The seed is borne in flat-topped clusters and does not ripen all at once. When the larger clusters are ripe the plant should be pulled and hung in a dry, shady place with good ventilation. As soon as the seed is well ripened, beat it off, clean, and store it. Different types of celery will cross, as will celeriac (turnip-rooted celery).

#### ONION

The edible part of the onion is composed of the swollen bases of the leaves, which accounts for onions being placed here rather than with root crops. Seed is not produced until the second season, after the bulbs have had a period of rest, but it is essential to the production of good seed that the seed-bearing bulbs should be well rooted. Often bulbs which have failed to make vigorous root growth will develop blossom heads and seem to set seed, which, however, will be found to have very little vitality. One will be most likely to succeed by selecting well-matured bulbs soon after harvest and storing them where the temperature will be between 40° and 50° F., until planting time in early spring. Plant 6 inches apart in rows, with the bulbs upright and just covered. As the seedstalks develop, support them by stakes (fig. 3). As the seed pods open and the seed turns black before it is ripe, care should be taken not to gather the heads until most of the seed is really ripe, but before it begins to shatter. Cut the seedstalks with about a foot of stem and spread them one head deep in trays lined with paper, in order to save the seed which falls out. Expose these trays to the sun and air until the seed is entirely dry; then rub it out, winnow, and store it.

Onion varieties hybridize freely, so only one variety can be grown in a garden from which seed is to be saved.

There are a number of kinds of onions that rarely produce seeds but are increased by sets or bulblets that grow in the blossom heads, often entirely replacing the blossoms. One group of these, called wintertop, asparagus, or perennial onion, does not make large bulbs, but is extremely hardy. The top sets of these may be planted anywhere in the United States during September and will give a good crop of early spring onions. These sets are easily stored

from the time of ripening until planting time in the autumn, and no gardener need purchase sets after once getting a stock.

Another group, called spring-top or red-top onions, is not quite so hardy, but the top sets will make good-sized dry bulbs for storing. They should be planted as early as possible in the spring. The sets, when ripe, may be stored in a cool attic or second-story room.



FIGURE 3.—Seeding plants of onion in a home garden. They are in blossom and should be staked.

There is still another type of these onions, called potato or multiplier onions, that does not make either top sets or seed. The bulbs of these split up into a number of bulblets, each of which, if planted in September, will produce large dry bulbs for winter use the following year. The large onions planted at the same time produce sets. This group is hardy as far north as central Pennsylvania and may be planted early in the spring north of that latitude. It produces heavy crops in highly enriched soil.

Shallots are similar to the potato onions just described, but they never grow into large bulbs. The two types are frequently confused, and sets of shallots are sometimes sold for potato onions.

#### LEEK

The saving of seed of leeks is identical with that for onions, but the plants are hardier and do not need so much protection.

#### POTATO

Potatoes are tubers or swollen stems and so are grouped here rather than with root crops. For the quantities used in the home garden it is, in general, better for the gardener to rely on his local dealer for a supply of northern-grown seed tubers. If he is located in the North, however, he can successfully save his own seed potatoes. These can be stored in a cold but frost-free cellar if available, but are very satisfactorily kept in an outdoor pit.

For further information in regard to potatoes, see Farmers' Bulletin 847, Potato Storage and Storage Houses.

#### BIENNIALS THE ROOTS OF WHICH ARE EATEN

All of the root vegetables except early radishes are biennials. The part used is the swollen root in which the plant has stored a supply of nourishment for use in the spring to push up its seedstalk in the shortest possible time. It is thus necessary to make seed growing a separate process from crop production. All the vegetables of this group cross to such an extent that only one variety of each can be grown in a garden. They will not intercross between the different vegetables.

#### PARSNIP AND SALSIFY

Parsnips and salsify are hardy, and the roots may be safely left in place through the winter. As early in the spring as they can be handled and before they start into growth, the roots should be dug, carefully sorted, and the selected ones immediately reset from 3 to 5 feet apart. They will start into growth at once, and generally will produce a good crop of seed. The parsnip can be safely left in place until the seed crop is fully ripe, when it can be cut and stored under shelter till dry. The heads of salsify open out as they ripen; and, unless gathered, the seed will be blown away. It is necessary, therefore, to gather the opening heads before noon of every sunny day and spread them in an airy place until dry, when the seed can be rubbed out, winnowed, and stored.

#### BEET, CARROT, TURNIP, AND LATE RADISH

The roots of the beet, carrot, turnip, and late radish must be stored over winter in some way, as they cannot endure freezing. Seed can rarely be grown satisfactorily from the large hard roots taken in the fall from the spring plantings and can seldom be grown profitably in the home garden. When seed production is attempted, it is best to make special plantings in midsummer, taking pains to protect the plants from early frost and to pull and store them before severely cold weather. For seeding, select roots of a uniform, desirable character, remove the tops without injuring the central bud, and bury them. Cover lightly at first, but to an increasing depth as necessary to prevent their freezing. Set the reselected roots as early as the ground can be worked, carefully protecting them from frost. As the seedstalks grow, support them by stakes.

Turnips must be harvested as soon as the pods turn yellow, and should be cut early in the morning to avoid shattering and laid on papers in a protected place. When the seed is ripe, it is readily beaten out; then it must be winnowed, spread thinly for further curing, and stored when dry.

Beets (figs. 4 and 5), carrots, and late radishes may have the seed left on the plant until ripe, when the stems should be cut and dried under shelter. The problem of threshing and cleaning is more difficult with these three kinds of seed than with most seeds. The pods of

radish and the seed-bearing branches of the beet and the carrot may be placed in a strong cloth bag and beaten or rubbed until the seed can be successfully winnowed and cleaned for storing.



FIGURE 4.—Seeding plants of beet, planted on the scale required for a home garden. Note that there is more than one plant and that the stalks are staked.



FIGURE 5.—Seeding beets grown on a scale suitable for a market garden.

It is very necessary to plant at least two roots of beets, turnips, or radishes together, as isolated plants often fail to produce seed on account of self-sterility. Carrots will hybridize with the wild carrots so common as a weed in parts of this country, thus lowering the quality of the crop.

## PERENNIAL VEGETABLES

Only two garden vegetables classed as perennials are common enough to require consideration here.

## ASPARAGUS

Asparagus is a plant of which the young, tender stems are the part used. An asparagus bed if well cared for will not need replacing for many years. The sexes are found on separate plants, so it is difficult to be sure that both parents of any lot of seed were superlative plants.

Seed saving should begin in the spring, when the plants that produce the greatest number of fine stalks should be marked by stakes. Seed from these selected plants will be better than unselected commercial seed. The best way to store small quantities is in the dried berries. These may be broken up at planting time. To clean asparagus seed in large quantities, beat the berries off the plants onto a sheet and then crush them in a barrel with a pestle or run them through the apple grinder or a hand cider mill. This crushed mass should be stirred in abundant water and the hulls poured off until the seed is clean, when it should be spread thinly and dried.

## RHUBARB

Rhubarb may be grown from seed, but seedlings show great variation. The seed is readily harvested and saved, but it is much better to purchase divided roots of known varieties.

LABELING, FUMIGATING, AND STORING VEGETABLE SEEDS<sup>2</sup>

Seeds that have been grown and carefully saved should be well labeled and stored, or all the previous labor goes for nothing. Cloth bags are the best containers for large seeds, such as peas, beans, and corn. They should be used also for larger quantities of small seeds, but for smaller lots paper envelopes, made at home or purchased, are most desirable. Ordinary letter envelopes are fairly satisfactory, but usually are not gummed so as to close completely, and if they are handled carelessly small seeds may sift out of them.

Correct labeling is of paramount importance. Every envelope or container should show the kind and variety of seed, the date, including month and year when harvested, and the place where grown. For the cloth bags, a slip of paper bearing all this information should be inserted with the seed. It is very convenient also to have a tag on the outside of the bag, but on no account should the inner label be omitted, because of the liability of the outside tag to become detached.

Many seeds, especially those of beans, corn, and lettuce, are subject to injury by a number of insects, all of which may be destroyed by fumigation with carbon disulphide. Carbon disulphide is a liquid that can be purchased in tin cans at any drug store. When poured into a dish, it evaporates rapidly, producing a foul-smelling gas that is heavier than air. Therefore, in fumigating seeds to kill insects attacking them it is necessary to place the carbon disulphide on top of the seeds in order that the gas may sink into them and

<sup>2</sup> For additional information, see Leaflet 220, Storage of Vegetable Seeds.

reach every part of the container. A tight tin pail, box, or barrel makes an excellent container for fumigating seeds. For a tight barrel full of seeds, one-half cupful of carbon disulphide is sufficient. For smaller containers, use proportional quantities.

Seeds to be fumigated must be dry, and if they are in paper bags the bags should be opened. The gas penetrates cloth bags easily. The liquid may be placed in any shallow dish, such as a saucer or plate, or merely poured on the seeds. The liquid will not injure the seeds if poured directly upon them. Immediately after the fumigation is started, the container should be covered with several thicknesses of heavy paper or other tight cover and allowed to remain covered from 1 to 2 days. A longer fumigation in tin pails is apt to injure the germinating power of the seeds.

**Carbon-disulphide gas is highly inflammable. No lights or fire of any sort should be brought anywhere near while fumigation is in process, as an explosion might occur.**

The foul odor of the gas disappears after the seeds have been aired for several days.

After the seed has been properly labeled, and fumigated if it requires treatment, it is necessary to store it in a dry, well-ventilated room. Cellars are too moist, attics usually are too hot, but a second-story room furnishes the ideal location. Seed can be protected against mice by being stored in tin boxes or mouse-proof wooden boxes or by being suspended in cloth bags away from walls or floors.

#### DURATION OF VIABILITY OF SEEDS

The question of how long certain seeds will retain satisfactory viability is often asked but cannot be answered with exactness. No table purporting to give exact periods is of much value when applied to any particular lot of seed. Weather conditions while the plants are growing and the care used in harvesting and storing them vary so much that the length of time that any certain sort of seed will be worth planting is impossible to predict.

Some seeds retain their viability longer than others, however, and vegetable seeds may be divided into three groups, as follows:

Good for 1 to 3 years: Beans, corn, leek, onion, parsley, parsnip, peas, rhubarb, and salsify.

Good for 4 to 6 years: Asparagus, beet, brussels sprouts, cabbage, carrot, cauliflower, celery, cress, kale, kohlrabi, lettuce, okra, pepper, radish, spinach, tomato, and turnip.

Good for 7 to 10 years: Chicory, cucumber, eggplant, endive, muskmelon, mustard, and watermelon.

(1) Comparatively short-lived, usually not good after 1 to 2 years: Corn, leek, onion, parsley, parsnip, rhubarb, and salsify.

(2) Moderately long-lived, often good for 3 to 5 years under favorable conditions: Asparagus, beans, brussels sprouts, cabbage, carrot, cauliflower, celery, chickory, cress, endive, kale, kohlrabi, lettuce, okra, peas, pepper, radish, spinach, turnip, and watermelon.

(3) Comparatively long-lived, under favorable conditions may be good for more than 5 years: Beet, cucumber, eggplant, muskmelon, mustard, and tomato.

